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THE LEAFHOPPER GENUS *EMPOASCA* SUBGENUS *KYBOS* IN THE SOUTHERN INTERIOR OF BRITISH COLUMBIA

K. G. A. HAMILTON¹

Entomology Research Institute
Canada Department of Agriculture
Ottawa, Ontario

ABSTRACT

The 22 species reported here represent 7 new species, 10 new Canadian records, and 5 previous records. *E. caesarsi*, *E. columbiana*, *E. coronata*, *E. dissimilaris*, *E. empusa*, *E. rossi*, and *E. tigris* n. spp. are described and illustrated. New Canadian records are *E. alaskana* Ross, *E. andresia* Ross, *E. betulicola* Wagner, *E. copula* DeLong, *E. exiguae* Ross, *E. fontana* Ross, *E. gelbata* DeLong & Davison, *E. portola* Ross, *E. rubrata* DeLong & Davidson, and *E. trifasciata* Gillette. Brief descriptions and a key are provided.

One of the most poorly studied genera of Canadian leafhoppers is *Empoasca* Walsh. This is a very large genus of small, green to orange insects that feed on a wide variety of forages, shrubs, and trees; many species are common, and quite a few are considered economically important, both for the damage they cause in feeding and for the transmission of "viral" diseases of crops.

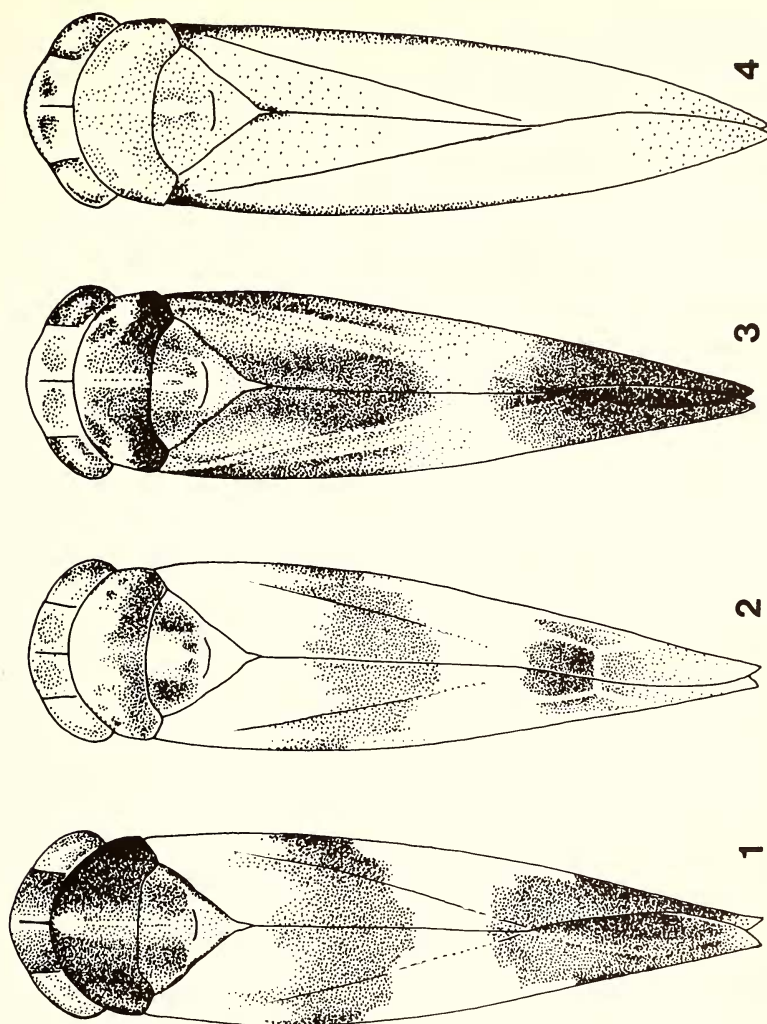
The genus is divided into three subgenera: *Empoasca* sensu stricto, *Kyboasca* Zachvatkin and *Kybos* Fieber. The first encompasses the majority of species, which feed mainly on forages and shrubs. There are many species complexes in this group, requiring much biological data to determine the specific limits. The available information is too incomplete at present to permit adequate treatment of this subgenus. *Kyboasca* is a small subgenus, characterized by the numerous tergal apodemes in the male abdomen. The species feed on a variety of trees, other than willow and poplar. All but two species collected in British Columbia have been previously recorded from Canada by Beirne (1956). The third subgenus is a moderately large group of species feeding almost exclusively on willows (*Salix* spp.) and

poplars (*Populus* spp.). *Kybos* is very well represented in British Columbia; I have taken 22 species in the interior, and others probably await discovery. Only 4 of these were previously recorded by Beirne, and another by Ross (1963). Most of the new Canadian records are of species found in adjacent areas in the United States.

The subgenus *Kybos* is characterized by male genitalia in which the anal hooks are strongly curved, and the minutely serrate style apices are curved and bear very long, fine setae. The subgenus may be more readily recognized by the chaetotaxy of the plates. The macrosetae are longer than the width of the plates, and either scattered over the ventral surface or arranged in many rows, instead of being short and biserrate, as in the other subgenera.

Characters used in identifying the species are the shape of the anal hooks and brachones (ventral pygofer processes), and the chaetotaxy of the base of the sub-genital plates. The apodemes of the second sternite and the third and fourth tergites (2S, 3T, 4T) of the male abdomen are also useful, although parasitized specimens are often encountered in which these are greatly reduced. Some species have distinctive colour patterns, and may thus be

¹ Present address: Department of Entomology, University of Georgia, Athens, Ga. 30601.



Figures

Figs. 1-4. Habitus of *Empoasca* (Kybos) spp. 1, *E. tigris* n. sp., male; 2, same, female; 3, *E. dissimilaris* n. sp., male; 4, same, female.

readily identified without dissection. Females are usually impossible to identify without associated males.

All types are deposited in the Canadian National Collection, Ottawa. (C.N.C.).

Key to males of species of *Empoasca* (Kybos) Fieber.

1. Dark, pronotum and scutellum wholly or partly deep reddish or fuscous; tegmina usually strongly coloured or marked with fuscous (Fig. 3) 14
- Pale, pronotum, scutellum and tegmina concolourous green, yellow or golden-orange; tegmina marked at most with

- weak fuscous dusting along veins and apical third (Fig. 4) 2
2. Dorsal margin of base of plates with long, stout, parallel-sided setae like those of ventral surface 10
- Dorsal margin of base of plates with fine, tapered setae 3
3. Apodemes 4T larger than 3T or 2S (Fig. 9) *rossi* n. sp.
- Apodemes 4T linear or absent, smaller than 3T and 2S 4
4. Brachone strongly clubbed (Beirne, 1956, Fig. 1028); head with red band between eyes near anterior margin *carsona* DeL. & Dav.

- Brachone not strongly clubbed; head unmarked with red 5
- 5. Apodemes 2S more than 2 segments long (Fig. 11) 9
- Apodemes 2S less than 2 segments long (Fig. 7) 6
- 6. Apodemes 3T lobed, more heavily sclerotized than apodemes 2S 8
- Apodemes 3T linear, similarly sclerotized to apodemes 2S 7
- 7. Apodemes 2S wider than long; apodemes 3T sinuate **incida** DeL.
- Apodemes 2S longer than wide; apodemes 3T straight **fontana** Ross
- 8. Apodemes 3T exceeding tips of apodemes 2S **caesarsi** n. sp.
- Apodemes 2S exceeding tips of apodemes 3T **columbiana** n. sp.
- 9. Apodemes 2S fully 4 segments long; apodemes 3T regularly lobate **patula** DeL.
- Apodemes 2S only 3 segments long; apodemes 3T arched outwards **exiguae** Ross.
- 10. Apodemes 2S at least 3 segments long; apodemes 3T linear **portola** Ross
- Apodemes 2S much less than 3 segments long; apodemes 3T lobate 11
- 11. Apodemes 3T over half as long as 2S; base of plates with only dorsal comb of setae **andresia** Ross
- Apodemes 3T less than half as long as 2S; base of plates with several peg-like setae on anterior margin as well as with dorsal comb of setae 12
- 12. Apodemes 2S over 3 segments long (Fig. 1) **empusa** n. sp.
- Apodemes 2S not over 2 segments long (Fig. 10) 13
- 13. Deep green; tip of brachone strongly flattened (Fig. 18b) **coronata** n. sp.
- Yellowish-green; tip of brachone tapered (Fig. 20b) **gelbata** DeL. & Dav.
- 14. Transversely banded (Fig. 1) 21
- Longitudinally striped, or with indefinite markings (Fig. 3) 15
- 15. Brown markings a patch on pronotum and tegmina tips, and along commissure and claval suture; anal hook very stout **betulicola** Wagner
- Brown markings otherwise, more extensive on dorsum of thorax; anal hook slender .. 16
- 16. Apodemes 3T shorter than half length of 2S 19
- Apodemes 3T over half as long as apodemes 2S 17
- 17. Apodemes 2S longer than 3T, turned outwards at tips **alaskana** Ross
- Apodemes 2S not longer than 3T, evenly curved at tips 18
- 18. Apodemes 3T and 2S subequal, less than 2 segments long **alberta** Ross
- Apodemes 3T longer than 2S, more than 2 segments long **dissimularis** n. sp.
- 19. Apodemes 3T lobate, $\frac{1}{3}$ length of 2S; base of plates with only dorsal comb of setae **lucidae** Ross
- Apodemes 3T linear and minute, or absent; base of plates with peg-like setae on anterior margin as well as dorsal comb of setae 20
- 20. Markings brownish; apodemes 2S more than 2 segments long **copula** DeL.
- Markings reddish; apodemes 2S less than 2 segments long **rubrata** DeL. & Dav.
- 21. Brachone widened at end; tegmina greenish to bright green **trifasciata** Gillette
- Brachone tapered to tip; tegmina pale yellow **tigris** n. sp.

EMPOASCA (*Kybos*) ALBERTA Ross

Empoasca (*Kybos*) *alberta* Ross, 1963: 216.

Blackish-brown with basal half of the tegmina brown, fading to hyaline tips; distinctive subequal 2S and 3T apodemes. Collected from: Okanagan Mission, Bear Creek (Westside Road, L. Okanagan), Creston, and Baldy Mountain, at 6500' (north of Bridesville): 4 specimens.

Host: recorded by Ross as *Salix* sp. Probably double-brooded; June to early July, and August.

EMPOASCA (*Kybos*) ALASKANA Ross

Empoasca (*Kybos*) *alaskana* Ross, 1963: 219 (new Canadian record).

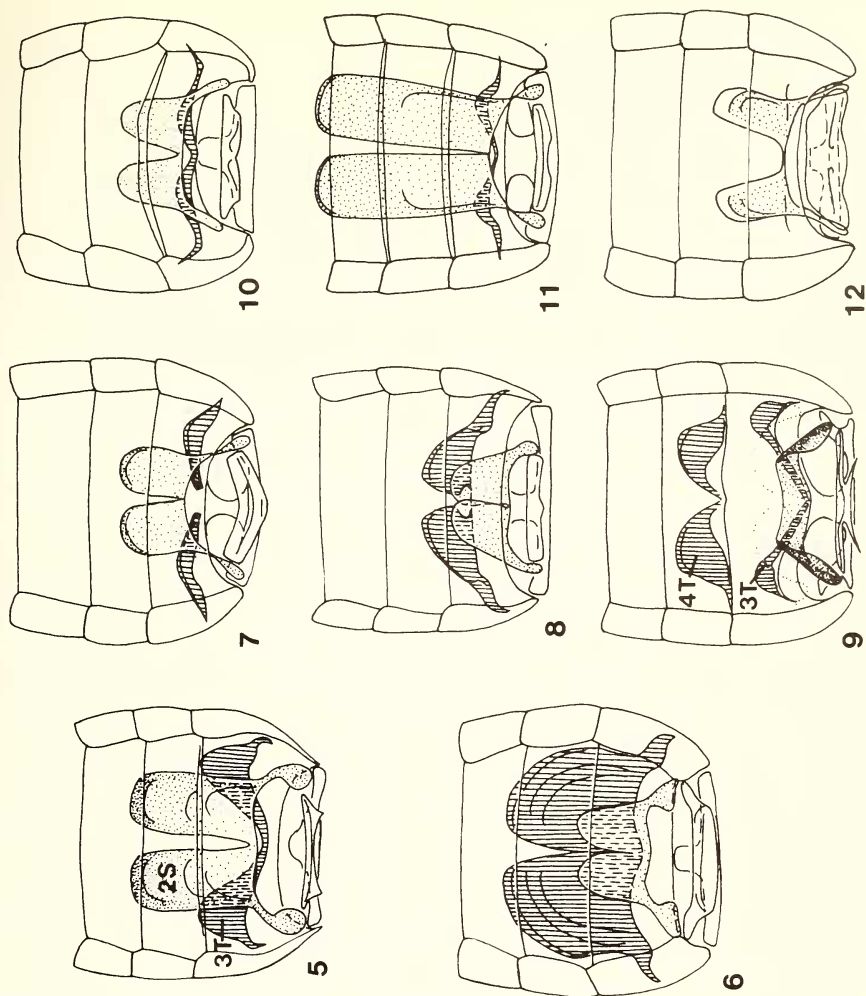
Sordid ochreous, with commissure deep brown; distinctive large 3T apodemes and divergent tips of 2S apodemes. Collected from: Naramata: 1 specimen.

Host: unknown. Collected in late July.

EMPOASCA (*Kybos*) ANDRESIA Ross

Empoasca (*Kybos*) *andresia* Ross, 1963: 218 (new Canadian record).

Yellow-green, with smoky wing tips and often also infuscated veins; distinctive short, lobate apodemes. Collected from: Armstrong, Creston, Naramata, Okanagan Mission, Otter Lake (south of Armstrong), Penticton, Salmon Arm, Summerland, and the following locations on the Westside Road of Lake Okanagan:



Figs. 5-12. Base of abdomen of *Empoasca* (*Kybos*) spp., showing second sternal (2S) apodemes stippled, third and fourth tergal (3T, 4T) apodemes hatched. 5, *E. tigris* n. sp.; 6, *E. dissimilaris* n. sp.; 7, *E. columbiana* n. sp.; 8, *E. caesarsi* n. sp.; 9, *E. rossi* n. sp.; 10, *E. coronata* n. sp.; 11, *E. empusa* n. sp.; 12, *E. rubrata* DeL. & Dav.

Bear Creek, Caesars, Ewings Landing, Nahun, and Wilson Landing; 205 specimens.

Host: recorded by Ross as various species of *Salix*. Single-brooded; mid-June through August, commonest in late July.

In view of the numerous records of this species from traps on sweet cherry, choke cherry, and bitter cherry (*Prunus emarginata* Dougl.) it seems likely that adults, at least, also feed on various species of *Prunus*.

EMPOASCA (*Kybos*) BETULICOLA

Empoasca betulicola Wagner, 1955: 178 (new Canadian record).

Yellow with tegmina and legs bright green,

heavily marked with fuscous on center of pronotum, along commissure and claval sutures, and on apical third of tegmina. Collected at Kelowna: 1 specimen.

Host: *Betula alba* L. Specimen taken on *Populus sargentii* Dode.

EMPOASCA (*Kybos*) CAESARSI n. sp.

(Figs. 8, 16)

Male. Length, 4.7 mm. Colour yellow-green, with slight orange cast on head and pronotum; tegmina green, claval suture white. General structure typical for subgenus. Apodemes 2S short, not extending into fourth segment, broadly lobate, turned inwards and

slightly overlapping; apodemes 3T short, very broad, strongly angled mesad, projecting only $\frac{1}{3}$ the length of fourth tergite, connected by very slender ridge. Eighth sternite weakly and bluntly produced. Anal hook tapered, evenly curved to sinuate tip. Brachone parallel-sided to attenuate, slender tip, curved most strongly at base. Base of plates with one row of erect marginal tapered setae and a second of recumbent setae of similar size.

Female. Length, 4.7 mm. Colour yellow-green, marked with white as follows: face with arrow-shaped mark pointing to marginal coronal dashes, dorsum with median line and paired longitudinal dashes on crown also; tegmina smoky green, with white claval suture. Seventh sternite very strongly produced to rounded tip, with prominent lateral angles.

Types. Holotype, ♂, Caesars, Westside Road, Okanagan Valley, B.C., 16-28 July 1971, sticky board trap on *Prunus emarginata*. Allotype, ♀, same data as holotype. Paratype: 1 ♀, same data as holotype. C.N.C. type number 12570.

Remarks. The very short and lobate apodemes are comparable only to those of *albolinea* Gillette; the shape of the 2S apodemes and the colour pattern of the female also indicate this relationship. *E. caesarsi* may be distinguished from this species by the shape of the 3T apodemes, the curvature of the brachone, and the prominent lateral angles of the female seventh sternite.

The fact that these specimens were taken on bitter cherry should not be interpreted as indicating that this is the host of *caesarsi*.

EMPOASCA (*Kybos*) CARSONA DeLong & Davidson

Empoasca carsona DeLong & Davidson, 1936: 229.

Empoasca aureoviridis; Beirne, 1956: 60.

Unmarked green to pale ochreous, with transverse red line between eyes (individuals may be patterned heavily with red); distinctive clubbed brachone. Collected from: Creston, Kelowna, Okanagan Mission, Penticton, Summerland, and Caesars (Westside Road, Lake Okanagan): 75 specimens.

Host: recorded by Ross as *Populus balsamifera* L. Local host: *P. trichocarpa* Torr. & Gray; a single specimen taken on *Populus sargentii*. Possibly double-brooded; late June to early July, and August.

EMPOASCA (*Kybos*) COLUMBIANA n. sp. (Figs. 7, 15)

Male. Length, 4.1 - 4.3 mm. Colour yellow-green, tegmina white, basally and apically lightly fuscous; abdominal tergites spotted with fuscous. General structure typical for subgenus. Apodemes 2S short, extending halfway into fourth segment, apically rounded, apodemes 3T short, scarcely lobate, separated at meson. Eighth sternite weakly produced. Anal hook long and slender, evenly curved cephalad. Brachone parallel-sided, apically slender, tapered to slightly sinuate tip. Base of plates with 3-5 long, slender, tapered setae.

Female. Unknown.

Types. Holotype, ♂, Otter Lake, south of Armstrong, British Columbia, 15-29 July 1971, sticky board trap on *Prunus emarginata*. Paratypes, 1 ♂, same data, Armstrong, B.C., 3 ♂♂, same data, 30 July - 12 August 1971. C.N.C. type number 12571.

Remarks. The small, separated 3T apodemes ally this species to *occidua* Ross, from which it can be readily distinguished by the shorter 2S apodemes and the long, slender brachone tip. The length of the plate setae show its relationship to the *occidua* complex rather than to members of the *carsona* complex, which it otherwise resembles.

The fact that the types were taken on bitter cherry should not be interpreted as indicating that this is the host for the species.

EMPOASCA (*Kybos*) COPULA DeLong
Empoasca copula DeLong, 1931: 27 (new Canadian record).

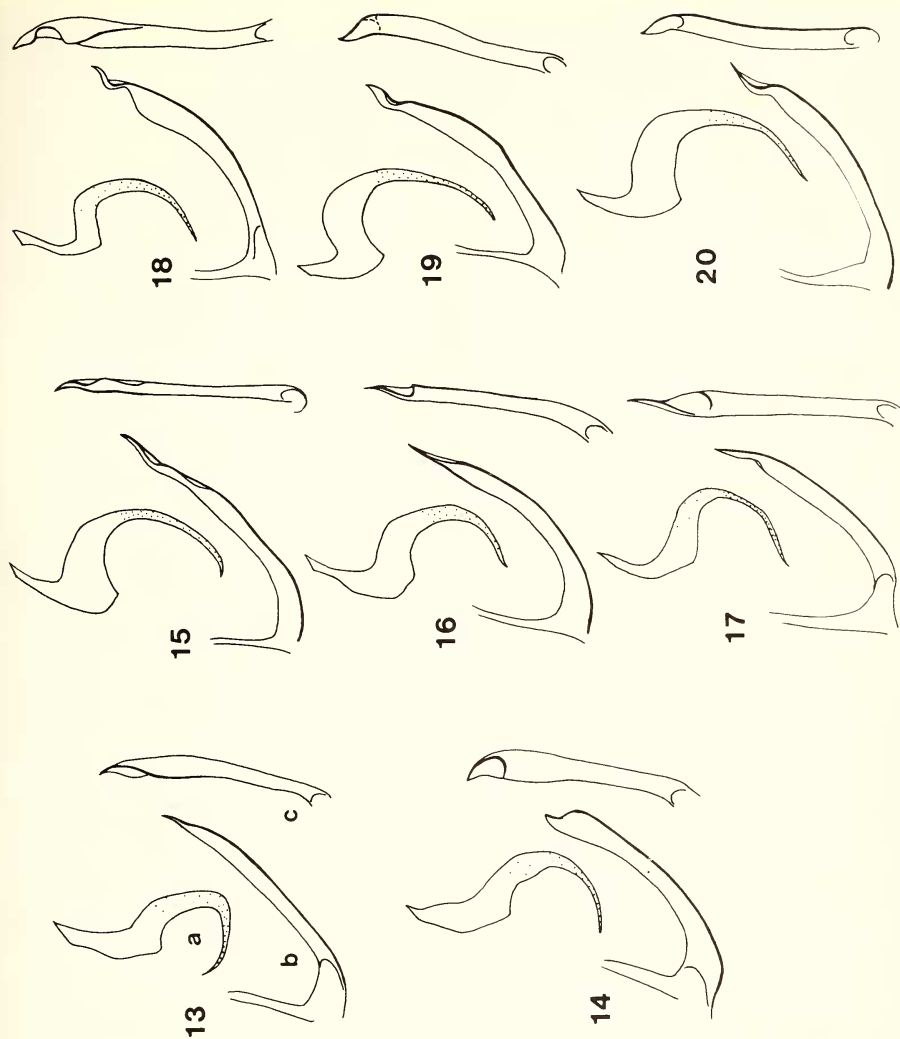
Green, with distinctive but indecisive markings: head orange, pronotum and wing apices deep brown, abdomen bearing a red spot at center, showing through clouded patch on wings as a brownish bar, giving specimens a banded appearance. Collected from: Ewings Landing, Okanagan Mission, and Summerland: 11 specimens.

Remarks. The species reported by Beirne (1956) as *copula* is the unmarked, orange and green *E. alexandrae* Ross.

Host: *Populus tremuloides* Michx. Single-brooded: mid-June through July.

EMPOASCA (*Kybos*) CORONATA n. sp. (Figs. 10, 18)

Male. Length, 3.9 - 4.3 mm. Colour deep green, unmarked; head turning golden-orange on drying. General structure typical for subgenus. Apodemes 2S short, extending halfway into fourth segment, evenly lobate,



Figs. 13-20. Genitalic hooks. a, anal hook, lateral aspect; b, brachone, lateral aspect, c, same, caudal aspect. 13, *E. tigris* n. sp.; 14, *E. dissimilaris* n. sp.; 15, *E. columbiana* n. sp.; 16, *E. caesarsi* n. sp.; 17, *E. rossi* n. sp.; 18, *E. coronata* n. sp.; 19 *E. empusa* n. sp.; 20, *E. rubrata* DeL. & Dav.

narrowly separated; apodemes 3T scarcely lobate, fused mesally. Eighth sternite strongly and convexly produced mesally, with tiny lateral angles. Anal hook tapered, evenly curved cephalad. Brachone widening to abruptly flattened and twisted apex, turned slightly laterad at tip. Base of plates with four long, parallel-margined setae dorsally and three peg-like setae on anterior margin.

Female. Length, 4.1 - 4.5 mm. Colour deep green, unmarked. Seventh sternite strongly tapered, strongly produced to bluntly angled apex; lateral margins with weakly rounded

angles; folded on meson.

Tpyes. Holotype, ♂, Powell Beach, Summerland, B.C., 17 June 1971, K. G. A. Hamilton, on *Populus tremuloides*. Allotype, ♀, Summerland, 23 June 1971, K. G. A. Hamilton, on *Populus tremuloides*. Paratypes: 2 ♂♂, 1 nymph, same data as holotype; 5 ♂♂, 5 ♀♀, same data as allotype; 7 ♂♂, same data, 5 July 1971. C.N.C. type number 12572.

Remarks. The apodemes of the abdomen indicate that this species is a close relative of *E. alexandrae* Ross, from which it may be

distinguished by the shorter and nearly separate 3T apodemes. The colour and flattened brachone tip distinguish this species readily from both *alexanderiae* and *gelbata*.

Host. *Populus tremuloides*. Single-brooded: mid June to early July.

EMPOASCA (*Kybos*) DISSIMILARIS n. sp.

(Figs. 3, 4, 6, 14)

Male. Length, 4.0 - 4.5 mm. Colour golden, deepening anteriorly, orange head, paling to lemon-yellow on abdomen and whitish hyaline on posterior 2/3 of tegmina, sternites infuscated, marked with blackish-fuscous as follows: paired coronal spots on head, all of pronotum except anterior margin and median line, anterior 2/3 of scutellum, basal half and apical third of tegmina, paler to whitish along claval suture. General structure typical for subgenus. Apodemes 2S small, lobate, appressed, extending into fourth segment, overshadowed by apodemes 3T which are very large and broad, hood-shaped, appressed, extending into fifth segment. Eighth sternite weakly and roundedly produced to tiny apical notch, wrinkled on posterior margin. Anal hook short, tapered, evenly curved anteroventrad. Brachone apically clubbed, tip acute, directed laterad. Base of plates with many long, fine, tapered setae.

Female. Length, 4.3 - 4.7 mm. Colour bright green, yellow on face, dorsum and tegmina golden, slightly fuscous apically; marked with deep green laterally and paired coronal spots. Seventh sternite very strongly produced between prominent lateral angles to truncate tip.

Types. Holotype, ♂, Summerland, B.C., 11 June 1971, K. G. A. Hamilton, on *Populus trichocarpa*. Allotype, ♀, same data as holotype. Paratypes: 16 nymphs, 6 ♂♂, 3 ♀♀, same data as holotype; 2 nymphs, 2 ♂♂, 2 ♀♀, same data, 16 June 1971; 5 ♂♂, 4 ♀♀, same data, 17 June 1971; 1 ♂, 1 ♀, Summerland, 23 June 1971, K. G. A. Hamilton, on *Populus tremuloides*; 1 ♂, Summerland, 15 June 1971, K. G. A. Hamilton, on weeds; ♂, Summerland, mid-June 1970, on sticky board trap on cherry; 1 ♂, same data, 21-27 July 1970; 1 ♂, Okanagan Mission, B.C., June 1970, sticky board trap on cherry; 1 ♂, Ewings Landing, June 1971, sticky board trap on *Prunus emarginata*. C.N.C. type number 12573.

Remarks. The extreme sexual dimorphism

in colour is unusual for this genus. The apodemes and plate setae are intermediate in length between those of *amicis* Ross and *annella* Hartzell, both of which this species resembles in genitalic characters. This species probably links the other two, providing evidence that the lineage to *annella* and *alberta* probably belongs to the *trifasciata* group rather than to the *butleri* group of Ross. The female seventh sternite is unique and highly distinctive.

Host. *Populus trichocarpa*. Single-brooded: mid June-July.

EMPOASCA (*Kybos*) EMPUSA n. sp.
(Figs. 11, 19)

Male. Length, 3.5 mm. Colour green, dorsum with bronze sheen. General structure typical for subgenus. Apodemes 2S very long and narrow, extending into sixth segment; apodemes 3T tiny, band-like, scarcely lobate. Eighth sternite roundedly produced to mesal notch, between small lateral angles. Anal hook very long and slender, nearly straight, curved cephalad at tip. Brachone widened on apical half, apex narrowed and sinuate, directed laterad. Base of plates with three peg-like setae directed cephalad and four long, stout, parallel-margined setae on dorsal edge.

Female. Unknown.

Types. Holotype, ♂, Armstrong, B.C., 15-29 July 1971, sticky board trap on *Prunus emarginata*. C.N.C. type number 12574.

Remarks. This species is closely related to *copula*, from which it can be distinguished by the green, unmarked colour and the longer and narrower 2S apodemes. The laterally-directed brachone tip is unique in this species group.

The fact that this specimen was collected on bitter cherry should not be interpreted as indicating that this is the host for the species.

EMPOASCA (*Kybos*) EXIGUAE Ross
Empoasca (*Kybos*) *exigua* Ross, 1963: 220 (new Canadian record).

Unmarked green, with rarer golden-orange form, like that of *albolinea* Gillette (= *digita* DeLong). Collected from: Naramata, Penticton, Similkameen and Summerland: 123 specimens.

Remarks. Parasitized specimens resemble *E. improcera* Ross, which may prove to be synonymous with *exigua*.

Host: Collected by Ross from *Salix exigua*. Common throughout lower Okanagan Valley on *Salix* sp. Single-brooded: late July to mid-August.

EMPOASCA (Kybos) FONTANA Ross

Empoasca (Kybos) fontana Ross, 1963: 223 (new Canadian record).

Unmarked green, females yellow-green, nymphs very deep green; distinctive small, pointed 2S and linear, transverse 3T apodemes. Collected from: Armstrong, Bridesville, Creston, Ewings Landing, and Okanagan Mission: 15 specimens.

Host: recorded by Ross as *Salix* spp., and sucker growth of *Populus balsamifera*; collected only on *Salix* sp. in British Columbia. Single-brooded; August.

EMPOASCA (Kybos) Gelbata

DeLong & Davidson

Empoasca gelbata DeLong & Davidson, 1936: 225 (new Canadian record).

Yellowish, unmarked, venter greenish and tegmina white; apodemes similar to those of *coronata*, but distinctly longer. Collected from: Armstrong, Kelowna, Penticton, and Salmon Arm; 13 specimens.

Host: collected on *Populus sargentii*, and on sticky board traps in the vicinity of other related species of cottonwood.

EMPOASCA (Kybos) INCIDA DeLong

Empoasca incida DeLong, 1931: 21.

Rather small; unmarked, green, apodemes 2S tiny and 3T curvilinear. Collected from: Creston, Kelowna, and Summerland: 12 specimens.

Remarks. This species has a wider host range than other species in the subgenus.

Host: recorded by Ross from both *Salix* and *Populus* spp.; taken in B.C. on both *Populus tremuloides* and cottonwood (*P. X sargentii*?). Single-brooded; late July through August.

EMPOASCA (Kybos) LUCIDAE Ross

Empoasca clypeata: Beirne, 1956: 60.

Empoasca (Kybos) lucidae Ross, 1963: 216.

Yellowish with the dorsum and tegmina smoky brown, paler on head and down center of each wing. Collected from: Penticton, Caesars, and Ewings Landing: 5 specimens.

Host: recorded by Ross as *Salix lasiandra*. Probably double-brooded; late June to mid-July, and August.

EMPOASCA (Kybos) PATULA DeLong

Empoasca patula DeLong, 1931: 22.

Empoasca patula var. *magna* DeLong, 1931: 23.

Bright green unmarked; distinctive 2S apodemes four segments long. Collected from:

Armstrong, Robson and Summerland: 20 specimens.

Host: *Salix* sp. Single-brooded; late June through July.

EMPOASCA (Kybos) PORTOLA Ross

Empoasca (Kybos) portola Ross, 1963: 215 (new Canadian record).

Large; pale green, often turning pale ochreous on drying; distinctive large 2S and linear 3T apodemes. Collected from: Camp McKinney, Caesars, Okanagan Mission, Penticton, Summerland, and Ewings Landing: 245 specimens.

Described from a pair of specimens collected on *Populus balsamifera*. Commonly on *Populus trichocarpa* in British Columbia, often being abundant on the sucker growth; also on cottonwood (*Populus X sargentii*?). Double-brooded; late June to mid-July, and August.

EMPOASCA (Kybos) ROSSI n. sp.

(Figs. 9, 17)

Male. Length, 4.6 - 4.9 mm. Colour pale green, unmarked. General structure typical for subgenus. Apodemes 2S very short, $1/3$ length of third tergite, strap-shaped, with posterolateral margins recurved. Apodemes 3T very small, lobate, widely separated, lying laterad of 2S; 4T almost as long as fourth tergite, broadly lobate, slightly turned outwards, contiguous but not fused at base. Eighth sternite weakly produced mesally, folded on meson. Anal hook slender and evenly curved cephalad. Brachone parallel-margined, apically flattened and tapered, curved regularly dorsad. Base of plates with very small, fine setae.

Female. Length, 4.8 - 5.1 mm. Colour pale green. Seventh sternite strongly tapered and produced to truncate apex, with small lateral angles.

Types. Holotype, ♂, Powell Beach, Summerland, B.C., 23 June 1971, K. G. A. Hamilton, on *Populus tremuloides*. Allotype, ♀, same data as holotype. Paratypes: 9 ♂♂, 11 ♀♀, same data as holotype; 1 ♂, 3 ♀♀, same data, 5 July 1971; 1 ♂, Summerland, 4-10 August 1971, sticky board trap on choke cherry. C.N.C. type number 12575.

Remarks. The well-developed 4T apodemes ally *rossi* to *gribisa* Ross and *sprita* Ross. These apodemes approximate those of *sprita* in size, but the lobes are well separated. Apodemes 2S are similar to those of *mesolinea* Dav. & DeL., suggesting that the *gribisa* group

is descended from the ancestor in the *trifasciata* group which also gave rise to *mesolinea*.

I take great pleasure in naming this species after Dr. H. H. Ross, both for his work in this subgenus, and for his continued help and encouragement in my studies.

Host: *Populus tremuloides*. Probably double-brooded; late June to early July, and early August.

EMPOASCA (*Kybos*) RUBRATA DeL. & Dav.

(Figs. 12, 20)

Empoasca rubrata DeLong & Davidson, 1936: 226.

Yellow with same markings as in *copula*, but those of body redder, giving it a pinkish cast; abdomen not so heavily tanned as in *copula*. Collected from Summerland: 17 specimens.

Remarks. Both parasitized and unparasitized specimens showed essentially the same features of small 2S apodemes and no tergal apodemes, thus demonstrating that this is indeed a distinct species. The specific characters were not illustrated by Ross, and so are figured here.

Host: cottonwood (*Populus X sargentii*?). Collected in August.

EMPOASCA (*Kybos*) TIGRIS n. sp.

(Figs. 1, 2, 5, 13)

Male. Length, 3.9 - 4.2 mm. Colour pale yellow, overlaid with black as follows: head, pronotum, and two triangular dashes on scutellum, paling on mid-line and edge of scutellum to fuscous, on lower part of head to sordid yellow; tegmina with transverse band at midlength as wide as pale bands, and apical third solidly marked. General structure typical for subgenus. Apodemes 2S long, extending into fifth segment, parallel-margined and apically subtruncate; apodemes 3T lobate, extending to fourth segment, placed laterad of 2S but not divergent. Eighth sternite as in *rossi*. Anal hook tapered, strongly angled anterodorsad at midlength. Brachone parallel-margined, straight, apically sharply pointed, tip scarcely directed outwards. Base of plates with numerous short, tiny setae.

Female. Length, 4.0 - 4.4 mm. Colour pale yellow, overlaid with fuscous as follows: crown bearing paired discal spots, pronotum bordered on posterior half, scutellum with triangles and paired mesal spots, tegmina with transverse band at midlength narrower than pale bands, and spot behind clavus tip showing pale veins. Seventh sternite roundedly produced between lateral angles.

Types. Holotype, ♂, Powell Beach, Summerland, B.C., 23 June 1970, K. G. A. Hamilton, on *Populus trichocarpa*. Allotype, same data as holotype. Paratypes: 1 nymph, 26 ♂♂, 6 ♀♀, same data as holotype; 8 ♂♂, same data, 21 June 1970; 1 ♂, Summerland, 7-13 July 1971, sticky board on *Cornus* sp.; 2 ♂♂, 3 ♀♀, Summerland, 5 July 1971, K. G. A. Hamilton, on *Populus tremuloides*. C.N.C. type number 12576.

Remarks. This species has the colour pattern of *trifasciata* Gillette, but has distinctly different apodemes and brachone. It resembles *livingstoni* Gillette in genital characters and apodemes, except that the brachone is not swollen apically, and the 2S apodemes do not have dorsal flaps; it differs from this species also in having transverse rather than longitudinal banding. The anal hook is unique.

Unlike most related species, *tigris* feeds on the upper surface of the leaves; it is usually found in association with *portola*, which seldom ventures to the upper side.

Hosts: *Populus trichocarpa* (probably preferred host) and *P. tremuloides*. Single-brooded, late June to mid-July.

EMPOASCA (*Kybos*) TRIFASCIATA Gillette

Empoasca trifasciata Gillette, 1898: 726. (new Canadian record).

Bright green to yellowish-green with irregular fuscous bands as in *tigris*, but lacking markings of crown and scutellum. Collected from Summerland: 4 specimens (no males).

Host: recorded by DeLong (1931) as Carolina poplar (*Populus X canadensis*). I have taken specimens on cottonwood (*Populus X sargentii*?). Probably single-brooded; early August.

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ADDITIONAL RECORDS OF SPIDERS (ARANEIDA) AND HARVESTMEN (PHALANGIDA) FOR BRITISH COLUMBIA

P. D. BRAGG AND R. E. LEECH¹

ABSTRACT

An annotated list is given of 47 species of spiders and 7 species of harvestmen not previously reported in faunal lists from British Columbia.

Nous présentons ici une liste annotée de 47 espèces d'araignées et 7 espèces de fauchers qui ne se trouve pas dans l'inventaire de la faune de la Colombie Britannique.

INTRODUCTION

Thorn (1967) recorded 212 species of spiders in British Columbia. The list was compiled from records scattered in the literature and from specimens in the British Columbia Provincial Museum in Victoria. Thorn overlooked two notes by Leech (both 1947) in which there are 13 additional species recorded.

The only harvestmen reported previously for the province are *Homolophus biceps* (Thorell) and *Leiobunum exilipes* (Wood) by Banks (1916), and *Sclerobunus nondimorphicus* Briggs and *Paranonychus brunneus* (Banks) by Briggs (1971).

The purpose of this paper is to present an annotated list of an additional 47 species of spiders and 7 species of harvestmen collected in British Columbia, mostly by the senior author. Harvestmen of the genera *Mitopus* and *Odiellus* also occur (according to Dr. Arlan Edgar, *in litt.*), but due to problems of nomenclature in these genera, they are not included in the list. Most of the specimens were collected in Vancouver. The initials "PDB" used below are those of the senior author. The spiders were identified by Leech, and the phalangids by Bragg.

ARANEIDA

AGELENDAAE

Cryphoea peckhami Simon.

Lighthouse Park, West Vancouver, 4 Sept 1966, PDB, on rock face, 1 ♀. U.B.C. Endowment Land Forest, Vancouver, 16 May 1971, PDB, on alder trunk, 1 ♀. New record for British Columbia. Known also from Oregon and Washington.

Cybaeus conservans Chamberlin and Ivie.

52 mi N.W. Manson Creek, 3200 ft alt, 30 July 1966, R. E. Leech, 1 ♀. New record for British Columbia. Previously known from Oregon.

Cybaeus eutypus Chamberlin and Ivie.

U.B.C. Endowment Land Forest, Vancouver, collected throughout the year as adults, PDB. Roth (1952:212) mentioned one specimen collected near Victoria. Known also from Oregon and Washington.

Tegenaria agrestis (Walckenaer).

Vancouver, 26 July 1962, PDB, webs in grass, 1 ♀. 18 Aug 1963, PDB 2 ♂♂. New record for British Columbia. Introduced to North America from Europe (Roth, 1968:5), and now well established in Oregon, Washington, and Idaho.

AMAURODIIDAE

Amaurobius borealis Emerton.

S.E. of Morley River Lodge (59° 57' N,

¹ 4610 West 6th Avenue, Vancouver, B.C., and Entomology Research Institute, Canada Agriculture, Ottawa, respectively.